

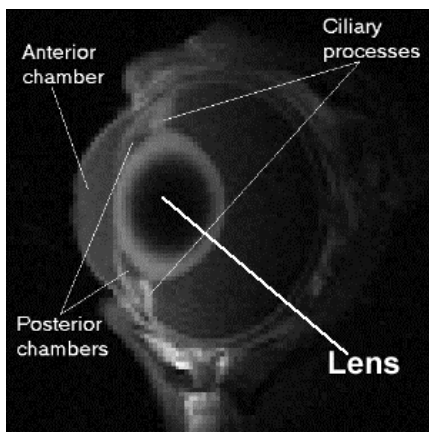
## ***Cataract in rabbits***

***Esther van Praag, Ph.D.***

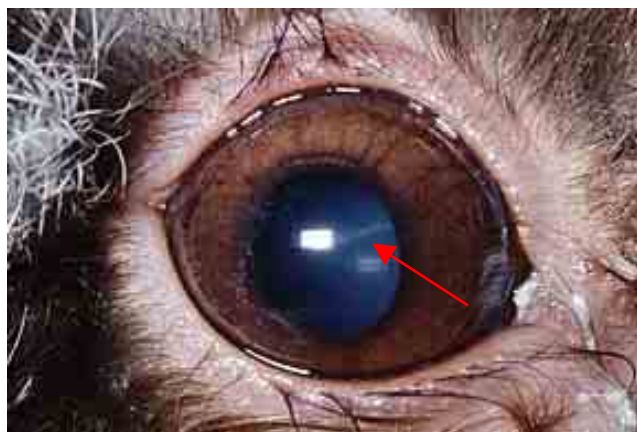
**Caution:** this file contains pictures that may be distressing for some persons.

The word cataract comes from the Latin "cataracta", or from the Greek katarraktēs, meaning waterfall. It refers to the progressive increase in opacity of the eye lens, which is sometimes referred to as "looking through a waterfall". The result is a reduced amount of light going through the lens. The ability to focus and eyesight sharpness will decrease with time. This is accompanied by a loss of contrast sensitivity. The ability to see objects in bright light will thus be reduced and it is not uncommon to see a rabbit hop into furniture or an object that is on its path.

The changes observed in the lens are related to the oxygen metabolism and the recycling of the glutathione protective molecule. Since the lens has no direct contact with the blood circulation, its level of oxygen is second lowest in the body, after the nervous system and the adrenal cortex. Oxidative respiration, carried out by the mitochondria organelles within the cells of the lens, is, however, able to produce enough ATP (form of stored energy in organisms) for the cells to function properly. This is accompanied by the formation of free radicals and other oxidative molecules. The later molecules are mainly neutralized by a smaller protein, glutathione. While glutathione is



[http://www.wellesley.edu/Chemistry/nhk/ppt\\_mri/htmlpages/mri\\_mrrabbit.html](http://www.wellesley.edu/Chemistry/nhk/ppt_mri/htmlpages/mri_mrrabbit.html)



Arie van Praag

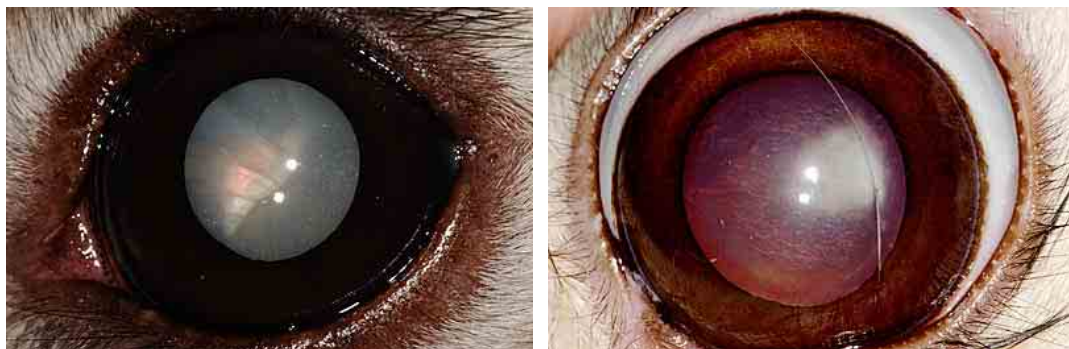
**Left: MRI of a rabbit eye, showing the location of the lens.  
Right: Healthy eye-lens, with a light-ray (arrow) passing through the lens**



oxidized, the free radicals are reduced and neutralized. The oxidized glutathione will move to the surface of the lens, where it will be reduced by the enzyme glutathione reductase, with the help of a co-enzyme derived from vitamin B<sub>3</sub>. The cycle enables to regenerate the glutathione, so it can be used again. Vitamin C also plays a protective role and its concentration within the lens is about 40 times higher than in the blood. Once the vitamin C has entered the lens cells, it will also start to reduce free radicals and other oxidizing molecules.

Cataracts observed in mammals and human beings can be classified in three categories:

- **nuclear cataract:** characterized by a degeneration of the proteins in the center of the lens (nucleus) due to age. It is typically related to increased levels of oxidized (dangerous) glutathione in the lens. Possibly the movement of the later is slowed down due to age or to a disbalance between proteins and lipid oxidation. The lens becomes white and later brown.



VEIN (Veterinary Exotic Information Network) System, Copyright © Akira Yamanouchi

**Left: Mature white nuclear opaque lens or cataract.  
Right: Mature brown cataract.**

- **cortical cataract:** is related to the disruption of the lens at the periphery and spreads towards the center. It is typically related to a decrease in the level of glutathione, accompanied by the excessive destruction of proteins, damage of the fiber plasma membrane or disruption of the calcium homeostasis (maintained relatively constant state within the body).
- **posterior subcapsular cataract,** characterized by the development of clusters of swollen cells in the back of the lens. Several clusters can develop, independently from each other. This type of cataract is rare and typically stress induced (e.g. UV) or due to medication (corticosteroids).



In rabbits, there is a fourth category, related to protozoal *Encephalitozoon cuniculi* induced cataract, with lens rupture.

Each type can be classified as immature (with areas remaining clear), mature (completely opaque), or hypermature (watery content of lens leaks into the capsule)

### Causes

The appearance of cataract is generally related to age.

Further contributing factors are heredity, nutrition, medication, exposure to sun light, presence of the protozoal parasite *Encephalitozoon cuniculi*, head-



Christine Goodhand

Rabbit suffering from *E. cuniculi* related cataract

trauma, or a diet poor in caretonoids. The incidence and the causes of cataract in rabbit is not well known. On the contrary to other animals, cataract development is not related to diabetes, a metabolic disorder that is very rare seen in rabbit.

Increased oxidative stress, due to the presence of free radicals, a breakdown of the protective mechanism, or a decreased glutathione cycle, lead to an accumulation of hydrogen peroxide in the aqueous humor of the eye. Although glutathione will reduce the peroxide, the energy-producing metabolism will be destroyed on the long term, enabling the diffusion of sodium into the lens. Osmolality (natural tendency to maintain water balance) will lead to edema (accumulation of water) in the lens. The proteins inside the lens oxidize, become opaque and insoluble (similar process as heat induced denaturation of



Susan L.

Effect of a flashlight on the healthy rabbit eye (background) and an eye affected by cataract.





Lisa Hutcheon



**Cataract can be unilateral (pictures) or bilateral.**

**ovalbumin and egg white proteins).**

**The free radicals attack the lipids present in the membrane leading to a shrinkage or swelling of the lens capsule. These changes of pressure inside the lens break the lens fiber membranes and the space will be filled with water and waste.**

### **Diagnosis**

**A comprehensive diagnosis enables to diagnose a cataract and monitor its development with time. Rarely, lens rupture is observed.**

### **Treatment**

**The treatment of choice for cataract is surgical removal, using the lensectomy phacofragmentation technique, without replacement of the lens. Indeed, regeneration of the lens has been observed in numerous rabbits. If this will not be the case, the rabbit will nevertheless be able to discern light and differentiate shapes.**

**If the cataract has been induced by the parasite *E. cuniculi*, the treatment includes the administration of fenbendazole (20 mg/kg, q 24 h., during a month). The use of albendazole is not recommended, as sudden death has been observed in healthy rabbits, after a single dose administration (private communication, Prof. P. Deplazes, DVM, University of Zurich, Switzerland)**





Amy Carpenter



### Accidental use of peroxide in the eye of a cottontail...

If uveitis is present and the lens cannot be removed surgically, the use of a topical NSAID or non-NSAID medication (e.g. prednisolone acetate 1%) is necessary.

When pain is present, the use of analgesics is recommended.

### Acknowledgement

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### Further information

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